

PATENT COOPERATION TREATY
PCT
INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P6314PC00	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. PCT/AU2003/001468	International Filing Date (day/month/year) 7 November 2003	Priority Date (day/month/year) 7 November 2003
International Patent Classification (IPC) or national classification and IPC Int. Cl. ⁷ E21D 20/02, E21B 33/12		
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1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of **4** sheets, including this cover sheet.
☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of **7** sheet(s).

3. This report contains indications relating to the following items:

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|------|-------------------------------------|---|
| I | <input checked="" type="checkbox"/> | Basis of the report |
| II | <input type="checkbox"/> | Priority |
| III | <input type="checkbox"/> | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| IV | <input type="checkbox"/> | Lack of unity of invention |
| V | <input checked="" type="checkbox"/> | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| VI | <input checked="" type="checkbox"/> | Certain documents cited |
| VII | <input type="checkbox"/> | Certain defects in the international application |
| VIII | <input type="checkbox"/> | Certain observations on the international application |

Date of submission of the demand 20 April 2005	Date of completion of the report 23 September 2005
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer LEOPOLD FILIPOVIC Telephone No. (02) 6283 2105

I. Basis of the report**1. With regard to the elements of the international application:***☐ the international application as originally filed.☒ the description, pages **1, 2 and 6-10**, as originally filed,
pages , filed with the demand,
pages **3-5**, received on **20 April 2005** with the letter of **20 April 2005**☒ the claims, pages , as originally filed,
pages , as amended (together with any statement) under Article 19,
pages , filed with the demand,
pages **11-14**, received on **16 September 2005** with the letter of **16 September 2005**☒ the drawings, pages **1 and 2**, as originally filed,
pages , filed with the demand,
pages , received on with the letter of☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**☐ contained in the international application in written form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished**4. ☐ The amendments have resulted in the cancellation of:**☐ the description, pages☐ the claims, Nos.☐ the drawings, sheets/fig.**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).****

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims 1-24	YES
	Claims	NO
Inventive step (IS)	Claims 1-24	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-24	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)

None of the documents cited discloses all the features of the invention defined by claims 1-24. Therefore the subject matter of these claims is new and meets the requirements of Article 33(2) PCT with regard to novelty.

The claimed invention is not obvious in the light of any of the cited documents nor is it disclosed in any obvious combination of them. It is also considered that it would not be obvious to a person skilled in the art in the light of common general knowledge either by itself or in combination with any of these documents. Therefore the subject matter of claims 1-24 meets the requirements of Article 33(3) PCT with regard to inventive step.

New citations:

- a) SU 1375830
- b) SU 1046531
- c) RU 2011840
- d) FR 2500053
- e) DE 4125011
- f) AU 16927/92

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/AU2003/001468

VI. Certain documents cited**1. Certain published documents (Rule 70.10)**

Application No. Patent No.	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
P, X AU 2003248215	22 April 2004	27 June 2005	27 September 2002

This document discloses all the features of claims 1-24.

2. Non-written disclosures (Rule 70.9)

Kind of non-written disclosure	Date of non-written disclosure (day/month/year)	Date of written disclosure referring to non-written disclosure (day/month/year)
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the grouting process causing grout to spill out of the hole entrance. The hole then requires "replugging". Cotton wadding is easily wasted and is useless once it becomes wet or soggy. Foam sprays are generally very expensive and require a "curing period" before cables can be grouted, thus adding a further step in the whole procedure. Foams require special handling (e.g. use of gloves to avoid contact with the skin) and may also produce toxic fumes and are not recommended in areas of minimum ventilation. Further to this, foam sprays are very messy and often result in wastage. Wooden spads or plugs do not generally provide a tight seal.

The present invention attempts to overcome at least in part some of the aforementioned disadvantages.

SUMMARY OF THE INVENTION

In accordance with a first aspect of the present invention there is provided a plug member for retaining grout in a substantially cylindrical bore in underground excavations, characterised in that the plug member comprises a cap portion arranged to engage with walls of the bore, the cap portion including at least one aperture arranged to receive a load bearing member in a close fit, and the cap portion including at least one port arranged to receive a grout delivery means in a close fit.

In accordance with a second aspect of the present invention there is provided a method of retaining grout in a substantially cylindrical bore in underground excavations, the method comprising the steps of inserting a plug member into the cylindrical bore, and inserting a load bearing member and a grout delivery means into the plug member.

DESCRIPTION OF THE DRAWINGS

The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic lower perspective view of a plug member in accordance
5 with the present invention;

Figure 2 is a diagrammatic side view of the plug member shown in Figure 1; and

Figure 3 is a diagrammatic top plan view of the plug member shown in Figures 1 and 2.

DETAILED DESCRIPTION OF AN EMBODIMENT OF THE INVENTION

Referring to the Figures, wherein like numerals and symbols refer to like parts
10 throughout, there is shown a plug member 10. The plug member 10 includes a cap
portion 20 comprising a cylindrical portion 22 provided with a substantially flat wall
24 laterally extending across a circumferential rim 21 of a leading end 9 of the
cylindrical portion 22 and a means to wedge the cap portion 20 within a cylindrical
bore. It is envisaged that the cylindrical bore will be a rockbolt hole, a cable bolt
15 hole, or a cylindrical bore of a rockbolt commonly known as a split set bolt.

Preferably, the cylindrical portion 22 has a diameter marginally smaller than a
diameter of a cylindrical bore, typically ranging from 30 - 90 mm, such that an outer
circumferential surface 29 of the cylindrical portion is substantially contiguous with
or adjacent to a circumferential surface of the bore when the plug member 10 is
20 placed inside the bore.

The means to wedge the cap portion within the bore preferably comprises a plurality
of downwardly inclined flaps 26 depending from a circumferential rim 23 of an
opposing end 7 of the cylindrical portion 22. However, the means to wedge the cap
portion 20 within the bore may also comprise a plurality of flaps inclined at varying

angles, a continuous resilient skirt, or a tapered bung.

The downwardly inclined flaps 26 are substantially rectangularly shaped and are equidistantly and equiangularly spaced around the circumferential rim 23 of the cylindrical portion 22 such that a gap 28 between adjacent flaps 26 is substantially
5 triangularly shaped. Preferably, the gaps 28 are replaced by a thin triangularly shaped membrane extending between adjacent flaps 26. Each flap 26 is provided with an upwardly tilted flange 25 depending from its lowermost edge 27.

The plug member 10 also includes a pair of spaced cylindrical walls 30 depending substantially perpendicularly from the flat wall 24 of the cap portion 20. Preferably,
10 the cylindrical walls 30 are disposed such that the cylindrical walls 30 are disposed adjacent to the circumferential rim 21 of the cylindrical portion 22. The spaced cylindrical walls 30 are interconnected by a web member 31, and are further stabilised with respect to the cap portion 20 by provision of respective ribs 33 interconnecting the cylindrical walls 30 to the cap portion 20. In use, the pair of spaced cylindrical
15 walls are arranged to receive a pair of load bearing members such as cable bolts.

A first portion 32a of the flat wall 24 enclosed by the cylindrical walls 30 is provided with a plurality of linear radial grooves 34 extending from a central axis of the first portion 32a and defining a plurality of triangular portions 36. In use, the first portion 32a is perforated along the linear grooves 34 such that the triangular portions 36 form
20 and behave as flexible flaps.

A second portion 32b of the flat wall 24 enclosed by the cylindrical wall 30 is a circular aperture provided with a plurality of inwardly disposed serrations 35. The diameter of the aperture is selected such that the inwardly disposed serrations abut an outer circumferential surface of the cable bolt received therein.

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CLAIMS

1. A plug member for retaining grout in a substantially cylindrical bore in underground excavations, characterised in that the plug member comprises a cap portion arranged to engage with walls of the bore, the plug member including means to wedge the cap portion within the bore, the cap portion including at least one aperture arranged to receive a load bearing member in a close fit, and the cap portion including at least one port arranged to receive a grout delivery means in a close fit, and a further port through which air may be vented.
2. A plug member as claimed in claim 1, characterised in that at least one aperture is substantially bounded by at least one resilient member, the resilient member acting, in use, against the load bearing member to substantially prevent the leakage of grout.
3. A plug member as claimed in claim 2, characterised in that the resilient member comprises an enclosing means whereby the enclosing means substantially prevents the leakage of grout through the aperture when a load bearing member is not present.
4. A plug member as claimed in any one of claims 1 to 3, characterised in that at least one port is substantially bounded by at least one resilient member, the resilient member acting, in use, against the grout delivery means or air venting means to substantially prevent the leakage of grout.
5. A plug member as claimed in claim 4, characterised in that the resilient member comprises an enclosing means whereby the enclosing means substantially prevents the leakage of grout through the aperture when a grout delivery means or air venting means is not present.

6. A plug member as claimed in any one of claims 2 to 5, characterised in that the enclosing means is comprised of a plurality of flexible flaps moveable between an open position and a closed position, wherein in the open position the flaps are engagable with an outer surface of the load bearing member, grout delivery means or air venting means and in the closed position the flaps inter-engage to substantially close the or each aperture or port and substantially prevent leakage of grout through the or each aperture or port.
7. A plug member as claimed in any preceding claim, characterised in that the cap portion comprises a cylindrical portion provided with a lateral wall extending across a first circumferential rim of a leading end of the cylindrical portion.
8. A plug member as claimed in claim 7, characterised in that the lateral wall is curved concave or curved convex.
9. A plug member as claimed in any preceding claim, characterised in that the means to wedge the cap portion within the bore comprises a continuous resilient skirt.
10. A plug member according to any one of claims 1 to 8, characterised in that the means to wedge the cap portion within the bore comprises a tapered bung.
11. A plug member according to any one of claims 1 to 8, characterised in that the means to wedge the cap portion within the bore comprises a plurality of downwardly inclined flaps depending from a second circumferential rim of an opposing end of the cylindrical portion.
12. A plug member as claimed in claim 11, characterised in that the downwardly inclined flaps are substantially rectangularly shaped and are equidistantly and equiangularly spaced around the second circumferential rim such that a gap between adjacent flaps is substantially triangularly shaped.

13. A plug member as claimed in claim 12, characterised in that a thin triangularly shaped membrane extends between adjacent flaps.
14. A plug member as claimed in any one of claims 11, 12 or 13, characterised in that each flap is provided with an upwardly tilted flange depending from its lowermost edge.
15. A plug member as claimed in any one of claims 8 to 14, characterised in that any number of spaced cylindrical walls depend substantially perpendicularly from the lateral wall extending across the first circumferential rim of the cylindrical portion.
16. A plug member as claimed in claim 15, characterised in that the cylindrical walls are disposed adjacent to the first circumferential rim.
17. A plug member as claimed in claims 15 or 16, characterised in that the cylindrical walls are interconnected by a web member.
18. A plug member as claimed in any one of claims 15 to 17, characterised in that the cylindrical walls are provided with respective ribs to stabilise the cylindrical walls with respect to the cap portion.
19. A plug member as claimed in any one of claims 15 to 17, characterised in that the cylindrical wall defines a circular portion of the lateral wall, the circular portion being provided with a plurality of linear radial grooves extending from a central axis of the circular portion, thereby defining a plurality of triangular portions, whereby the grooves are adapted to be perforated or piercable such that the triangular portions form and behave in use as flexible flaps.

20. A plug member as claimed in any one of claims 15 to 17, characterised in that the cylindrical wall defines a circular aperture in the lateral wall, the circular aperture being provided with a plurality of inwardly extending serrations.
21. A plug member as claimed in any one of claims 8 to 20, characterised in that the or each port is disposed in the lateral wall of the cap portion.
22. A plug member as claimed in any one of claims 8 to 21, wherein the flexible flaps of the or each port are substantially equal sized triangular portions spaced equiangularly within a circular indentation in the cap portion.
23. A plug member as claimed in any preceding claim, characterised in that the plug member is formed from a semi-rigid material.
24. A method of retaining grout in a substantially cylindrical bore in underground excavations, the method comprising the steps of inserting a plug member having a cap portion into the cylindrical bore, wedging the cap portion within the bore, inserting a load bearing member in the plug member, inserting a grout delivery means into the plug member, and venting air through a port in the plug member.